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THE RELATIONSHIP BETWEEN THE WISC AND THE CANADIAN LORGE-THORNDIKE INTELLIGENCE TESTS

BY

HELEN NEUFELD

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled THE RELATIONSHIP BETWEEN THE WISC AND THE CANADIAN LORGE-THORNDIKE INTELLIGENCE TESTS submitted by Helen Neufeld in partial fulfilment of the requirements for the degree of Master of Education.

ABSTRACT

The relationship between the Lorge-Thorndike Intelligence Test and the Wechsler Intelligence Scale for Children was examined in this study. Sixty-two students who had written the Canadian Lorge-Thorndike group test were selected randomly from the total grade eight population of the Edmonton Roman Catholic Separate School System. The sample was individually tested using the Wechsler Intelligence Scale for Children (WISC). A one-way analysis of variance and principal components factor analysis followed by varimax rotation were used to analyze the test results.

Intercorrelations between Lorge-Thorndike and WISC subtests were generally low (<.61). Factor analyses strongly reflected the inadvisability of substituting any of the Lorge-Thorndike subtests for WISC subtests as valid diagnostic indicators. There appeared to be one strong factor present in the Lorge-Thorndike which was nonexistent in the WISC. This Lorge-Thorndike factor might have been a reading factor and may have partially accounted for the low intercorrelations between instruments.

At the grade eight level, the Lorge-Thorndike subtests and the individual Wechsler subtests appeared to measure different characteristics. Such differences seemed too great to justify the use of the group test as a substitute for the WISC as a diagnostic instrument.

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CHAPTER I

INTRODUCTION

School systems are faced with continuous demands for intellectual or ability assessments. Results of these evaluations are often used to make decisions about educational placement or to determine the degree to which intellectual capability is related to academic performance. One of the major decisions to be made by a school system in meeting this demand is whether to use group or individually administered tests.

Except in cases where specific individual diagnosis is needed, the standardized group tests are usually preferred because of their relative ease of administration by the classroom teacher, the shorter time needed to test large numbers of students and the relative ease with which most group tests may be scored and interpreted. Group intelligence tests, however, are seriously limited in their ability to measure deficits in certain motor or complex functions such as reading. Also, group tests are not usually amenable to the same diagnostic analysis as carefully administered individual tests. This diagnostic value is of particular importance during early school years when recognition of individual difficulties may more easily lead to appropriate modification of the child's learning environment. Publishers of group intelligence tests usually recognize the limitations of their

tests for diagnostic purposes and recommend that in borderline cases or in the case of the slow learner, the individual test should be used for evaluation and placement (Lorge, Thorndike, 1967). Considering, however, the time and expense involved in individual testing on a large scale, and the amount of time which qualified personnel could realistically devote to individual testing, a constant demand exists to find alternatives which would produce equally reliable data. Several recent attempts to find a reasonable substitute for the WISC were reported by Houston and Otto (1968) and by Lessler and Galinsky (1971). In the latter study the Slosson Intelligence Test (SIT, 1963) proved useful in the selection of students to be placed in special classes but was reliable only for students falling in the range of I.Q.'s below 60. The Slosson Intelligence Test, an individual test that can be administered by a relatively untrained person, is nonetheless too time consuming for en masse testing. The Edmonton Roman Catholic Separate School System (ERCSSS) decided to investigate the use of the Canadian Lorge-Thorndike Intelligence Tests (CLT) as a possible group alternative to the individual WISC.

Statement of the Problem

The primary concerns of this study were to determine whether or not the subtests of the CLT correlated highly with Wechsler Intelligence Scale for Children (WISC) subtests and whether or not

it would be reasonable to substitute the group test for the individual test, thereby justifying the possibility of using the group test as a diagnostic instrument. If used at an early school age this would be valuable in detecting students requiring remedial, enriched or other special classes. Several additional questions were studied:

1. Does the total CLT test appear to be measuring the same general trait as does the WISC?
2. Do the Verbal, Nonverbal, and Total batteries of the CLT and the WISC appear to produce similar I.Q. scores?
3. Is there evidence of a possible reading factor in the CLT group administered test?

Description of the Instruments

The CLT Intelligence Tests were designed to measure ability to work with ideas and with the relationships among ideas. It was selected as the group test by the ERCSSS because of the nature of the test by which the same instrument may be given to the same child at two or three grade levels in various years. The CLT compared favorably with other tests in predicting academic achievement in Edmonton (Nyberg, 1969). Reliability for grade eight students was .85 for both V and NV batteries (Nyberg, 1969). The CLT V battery is made up of five subtests: Vocabulary (or Word Knowledge), Sentence Completion, Verbal Classification, Verbal Analogy and Arithmetic Reasoning. The NV battery is entirely pictorial,

diagramatic, or numerical and is composed of: Pictorial Analogy (or Figure Analogies), Pictorial Classification (or Figure Classification) and Numerical Relationships (or Number Series). The publishers, Wright, Thorndike and Hagen (1972), state that both batteries involve the following characteristics which describe intelligent behavior:

1. The tasks deal with abstract and general concepts.
2. In most cases, the tasks require the interpretation and use of symbols.
3. In large part, it is the relationships among concepts and symbols with which the examinee must deal.
4. The tasks require the examinee to be flexible in his basis for organizing concepts and symbols.
5. Experience must be used in new patterns.
6. Power in working with abstract materials is emphasized rather than speed.

The WISC V Subtests are:

Information	measures memory of detailed data, dependent upon previous exposure.
Comprehension	indicates awareness of expected social responses, largely dependent upon common sense.
Arithmetic	measures auditory memory and ability to solve orally presented arithmetic word problems. Scores are affected by anxiety or poor mathematical knowledge.

Similarities	indicates level of awareness of relationships or classifications noted as concrete, functional or abstract.
Vocabulary	indicates knowledge of word meanings. Scores are affected by environment and formal training.
Digit Span	measures ability to hold sequence and manipulate unrelated auditory stimuli. Scores are influenced by anxiety.

WISC P Battery includes:

Picture Completion	measures ability to note pertinent missing details. Scores are affected by visual-perceptual deficit.
Picture Arrangement	measures ability to sequentially arrange pictures in a cause-effect relationship. Requires social awareness, noting of details, visual perception and common sense.
Block Design	measures ability to analyze and reproduce abstract designs with blocks; involves ability to form a gestalt, reduce to parts, and reconstruct.
Object Assembly	involves the part-to-whole construction of familiar objects; requires organization, visual perception of details, and recognition of gestalt from minimal clues.

Coding — involves the copying of nonfamiliar, nonmeaningful symobls for familiar digits. Scores are influenced by visual memory, eye-hand control.

Since the introduction of the revised Stanford-Binet Intelligence Scale Form LM (S-B) in 1960, the WISC has been the criterion test used for validating other intelligence scales. Correlations between the revised S-B and the WISC fall in the .70 range (Zimmerman and Woo-Sam, 1972). Although early research results were not definitive (Hopkins and Michael, 1969), the current general consensus among diagnoticians indicates that "test pattern analysis, particularly of the WISC, is a technique that is now used by many knowledgeable diagnosticians and can be used along with a good academic check to plan meaningful remedial programs for the learning disabled child" (Wills, 1971). A recent study reflecting the diagnostic value of the WISC was reported by Ackerman, Peters, and Dykman (1971), where it was found that a V I.Q. between 90 and 105, a Performance I.Q. between 90 and 100, or both, combined with an immature Bender profile, a slow reaction time, and possibly early school entry were indirectly indicative of possible learning disabilities in elementary school boys.

Roebeck (1964), Altus (1956), Burks and Bruce (1955), Graham (1952), Hirst (1960), Kellos et al (1961), Neville (1961), Roebeck (1958), Sheldon and Garten (1959) have all discussed the

use of the WISC as a discriminator of severely or mildly disabled readers. In an examination of 90 mildly disabled readers and 90 severely disabled readers from the Syracuse University Reading Center, Sawyer (1965) concluded:

> It would seem that it is possible to discriminate between a group of severely disabled readers and a group of mildly disabled...by using either eleven (WISC) subtests or seven subtests. There is also indication that the discrimination is more effective at younger levels.

Limitations of the Study

In this study no attempt was made to justify the use of system-wide testing or to justify intelligence testing per se since the ERCSSS had already decided to introduce the testing. A major purpose of this study was to assist the ERCSSS in determining whether or not the CLT would provide a feasible alternative to individual testing. Since the CLT was given according to grade and not age, no attempt was made to limit the WISC administration to students of any particular age level. Generalizations from this study can be made only to grade eight students in the ERCSSS or similar systems in Alberta. Further generalizations to other grades, smaller systems, or systems outside Alberta is not advisable without further investigation.

A major consideration in this study is the fact that U.S. norms are used for the WISC and Canadian norms for the CLT. If Canadian norms were available for both tests, a further study could add valuable information to the current research. Some possible differences between WISC and the CLT scores in the present study may arise from a difference in time of year of administration. The five or six month age difference is considered when calculating the standard scores for both instruments but factors such as examination pressure during late spring testing could influence the scores either way. Other factors, however, such as the one-to-one relationship between examinee and examiner of the WISC plus the fact that the WISC examiners were not school personnel could offset any negative aspects resulting from spring testing. If the study were to be repeated it would be advisable to conduct both test administrations near the beginning of the school year.

CHAPTER II

REVIEW OF RECENT RELATED LITERATURE

Prior to the introduction of the S-B LM in 1960 many studies attempted to validate the WISC by comparing it to the S-B L. Since 1960 these studies have decreased in number and have become very specific in nature (Estes, Curtin, De Burger, Denny, 1961; French, 1964; Jones, 1962; Levinson, 1960; Lucito, 1960; McCoy, 1963). Several studies have compared the revised S-B LM with the WISC (Barclay, 1966; Estes, 1965; Estes, 1961; Rohrs, 1962; Sonneman, 1964; Walker, 1970; Zimmerman and Williamson, 1965).

Correlations between S-B LM and WISC FS for normal children ranged from .74 (Estes, 1960) to .89 (Brittain, 1968). In an attempt to lessen the demands of administration and time needed to administer the WISC, several studies have assessed the utility of employing the Peabody Picture Vocabulary Test (PPVT) (Dunn, 1959) as a major measure of intelligence in a test battery (Moed et al, 1963; Hughes and Lessler, 1964-5; Gage and Naumann, 1965; Shaw et al, 1966; Flax, 1968; Neville, 1965). These authors generally recommended the use of the PPVT as a brief screening device of value when saving of administration time is critical. Estimation of WISC scores from PPVT scores was generally not recommended and the dangers of equating statistical significance with practical utility were emphasized. Correlations of the WISC

with other individual intelligence tests seemed to indicate that the WISC and any other alternatives were not measuring similar traits and could not be interchanged.

Because of the great demand for evaluations and the shortage of qualified examiners, there is a constant search for group instruments that can be administered more easily, quickly and inexpensively than standardized individual intelligence tests. Corwin (1965), Altus (1952, 1955) reported correlations between WISC and California Test of Mental Maturity of .61 and .86. Estes (1961) found the Pearson product-moment correlation between the WISC and the Otis Quick Scoring Mental Ability Test, Beta to be .67.

Extensive searching of the literature revealed relatively few comparative studies between the WISC and the LT Intelligence Tests. Two studies by Corwin (1965) and Sonneman (1964) with school children aged nine and ten reported correlations between the two Verbal batteries of .66, between the two nonverbal batteries .54 and the two Full Scale scores of .69

Neville (1965) in his study of the relationship between reading skills and intelligence test scores for 148 fifth graders reported that:

> 1. Poor readers [grade 4.00 or below, as measured by the Metropolitan Achievement Test] in this fifth grade sample tended to make scores on group intelligence tests requiring reading [Lorge-Thorndike Verbal Battery] which were significantly lower than the scores made on individual tests requiring little or no reading [WISC and PPVT] .

2. Average readers [grade 4.00 to 4.99] tended to make scores on group intelligence tests which were not different from their scores on individual tests.

3. The good fifth grade readers [grade 5.00 or above] tended to make scores on the group intelligence tests which were as high as, or higher than their scores on the individual tests.

From the above, Neville concluded that a grade five student "whose reading level is below grade 4.00 is almost certain to have his intellectual functioning significantly underestimated by verbally oriented group intelligence tests. It then becomes necessary to administer an individual test if this pupil's academic aptitude is to be assessed realistically". Blair and Kamman (1942) stated that intelligence tests requiring reading ability do not discriminate against poor readers at the first year university level.

A study by Churchill and Smith (1966) relating the 1960 revised S-B Intelligence Scale to the LT V and NV batteries over a three year period indicated a correlation between the S-B and LT V of .79 and a correlation of .65 between the S-B and LT NV. They also reported correlations of .84 and .65 between sixth grade Iowa Test of Basic Skills results and LT V and NV scores respectively. Churchill and Smith concluded that for their sample "an individual mental test, a group mental test, and a comprehensive achievement battery are comparable in their predictive ability".

The technical manual for the U.S. LT (1966) reported correlations ranging from .62 for LT V and WISC Performance to .83 for LT V and WISC V. Willis (1970) reported a correlation of .81 between the LT V I.Q. and the WISC V I.Q. on a sample of twenty emotionally disturbed children. He also commented that while the two tests correlated well, thirteen of the subjects tested "had WISC V I.Q.'s which were so much higher than their LT values that Ss' intellectual classifications changed. Only five Ss obtained scores on the two tests within 5 I.Q. points of each other, and none had WISC V I.Q.'s more than 5 points below the LT values". He concluded that "disturbed children may require structure, order, and more direct concrete contact with the teacher to perform adequately".

A study by Karnes (1969-70) compared the scores of readers and nonreaders on the four WISC and LT batteries as well as those of the D48 Test and the GW Scale of the Welsh Figure Preference Test on eighty-seven eighth grade boys in North Carolina who were divided into three groups. The first group was composed of public school boys of normal intelligence and of average or above reading achievement by previous testing; the second group was comparable in intelligence and reading achievement but was generally classified as underachieving; the third group was also of normal intelligence but was classified as nonreading (reading achievement less than 4.0 grade level). His study showed that the LT V contributed the largest degree of difference to an overall significant difference

found among the three groups on the six scales. "When differences due to the LT Verbal, WISC Verbal, and WISC Performance were covaried out, neither the LT NV nor the D48 differentiated among the three groups". However, significant correlation coefficients were computed for each of the three groups' scores between the LT NV and the LT V, the WISC V, WISC Performance, WISC Full Scale and the D48. It was suggested that the LT NV scale and the D48 could be used as a measure of general mental ability with groups of grade eight boys with varied reading achievement.

Any studies referred to above, which have utilized the LT Intelligence Test, have employed the United States version of this test. The only research available which compared the 1967 CLT Intelligence Test with the WISC was reported in the CLT Technical Supplement by Wright, Thorndike, Hagen (1972). In the Saskatoon study just mentioned, 58 grade six students and 71 grade eight students (both nonrepresentative samples) were tested with the CLT and the WISC within three years of each other. The grade eight data showed that the two V batteries correlated .71, the WISC Performance and CLT NV .61 and the two Full Scale scores .75. Corresponding correlations in the present study were .70, .58, and .74. For grade six students the correlations are lower and the CLT NV battery correlated better than the V battery with both the WISC V and Performance batteries. Correlations between the CLT and the S-B from the same study ranged from .74 for the CLT NV and S-B to .83

for CLT Full Scale and S-B. It should be noted, however, that in the CLT, S-B comparisons from three to five years separated the administration of the two tests.

CHAPTER III

DESIGN OF THE STUDY

Verbal Hypothesis

H_0: Subtest scores obtained on the CLT Intelligence Test and on the WISC do not differ significantly.

H_1: Subtest scores obtained on the CLT Intelligence Test and on the WISC do differ significantly.

Sample and Administrative Procedures

By means of a random digits table seventy-five eighth grade students were selected from all of the grade eight students in the ERCSSS who had previously written the CLT in that year. The 2,327 students were listed alphabetically by school; the entire group was numbered; then seventy-five numbers were selected. Thirteen of the original sample of seventy-five were eliminated from the sample because the particular school involved did not keep the CLT answer sheet containing the subtest scores. Eighteen schools were represented. The oldest student tested was sixteen years, three months. The remaining students were all under sixteen years. TABLE 1 indicates the number of students by school; TABLE 2 indicates the number of students by age.

During November, all of the eighth grade students in

TABLE 1

NUMBER OF STUDENTS BY SCHOOL

SCHOOL	NUMBER OF STUDENTS
Academie Assomption	3*
St. Alphonsus	3*
St. Andrew	1
St. Basil	3
Cartier-McGee	3
St. Catherine	3
St. Cecilia	8
College St.-Jean	3
St. Edmund	4
St. Francis of Assisi	7*
St. Gabriel	3
Holy Cross	12
St. James	3
St. Kevin	2
St. Mary's	4
Mount Carmel	2
St. Paul	1
St. Pius X	4
Sacred Heart	2
St. Vincent	2
St. Clare	2
21 Schools	62 Students

*Schools originally included in the sample but eliminated because Lorge-Thorndike answer sheets were not available.

TABLE 2

NUMBER OF STUDENTS BY AGE

AGE	NUMBER OF STUDENTS
12 years	1
13 years	29
14 years	27
15 years	4
*16 years	1

*The writer is aware that norms do not exist for age 16 years, however, the 16 year old student was included in the final sample because of special circumstances.

the ERCSSS were given the CLT Intelligence Test as part of a system-wide testing scheme. The following April and May, the seventy-five students sampled were individually assessed using the WISC. Thirty of the sixty-two students retained in the sample were assessed by the writer, the remaining thirty-two were assessed by two properly qualified graduate students.

Treatment of the Data

Subtest and total standard scores for both the CLT and WISC V batteries were correlated for the sixty-two subjects. The resulting twelve-by-twelve matrix included the following: WISC (Information, Comprehension, Arithmetic, Similarities, Vocabulary and Total Verbal Score); CLT (Vocabulary, Sentence Completion, Arithmetic Reasoning, Verbal Classification, Verbal Analogy, and Total Verbal Score).

Subtest and total standard scores for both the CLT and WISC nonverbal batteries were also correlated for the sixty-two subjects. The resulting ten-by-ten matrix included the following: WISC (Picture Completion, Picture Arrangement, Block Design, Object Assembly, Coding, and WISC Performance Total); CLT (Pictorial Classification, Pictorial Analogy, and Numerical Relationships). An overall eighteen-by-eighteen matrix was also obtained, excluding the four total scores.

V, NV, and Full Scale intelligence quotients for both the

CLT and WISC were subjected to a one-way analysis of variance. The model used was a single factor experiment with repeated measures, person by subscores, outlined by Winer (1962, pp.105-139). Six types of subscores were used: WISC V, WISC P, WISC Full Scale, CLT V, CLT NV, and CLT Full Scale (estimated). A Newman-Keuls Test on All Ordered Pairs of Means and a Tukey (a) Test were used to determine where differences existed between pairs of subtests.

The three correlation matrices (V, NV and Overall) mentioned above were then subjected to factor analysis. All total scores were excluded.

CHAPTER IV

ANALYSIS OF THE DATA

Results of the analyses are outlined in three sections: Intercorrelations, Analysis of Variance, and Factor Analysis.

Intercorrelations

Results of the WISC and CLT Verbal subtest intercorrelations are indicated in TABLE 3. Analysis of this table indicates the following conclusions:

1. All five WISC V subscores and total scores correlated higher with the CLT V total than with any other CLT subscore. (Range .36 - .70)
2. Three of five CLT V subscores and total correlated higher with WISC V total than with any other WISC subscore. (Range .53 - .70) Exceptions were CLT Vocabulary which correlated highest with WISC total and Vocabulary (.60), and CLT Arithmetic Reasoning which correlated highest with WISC Information (.38).

From TABLE 4 indicating WISC and CLT nonverbal correlations, it may be noted that:

1. All three CLT NV subscores and total correlated higher with WISC P total than with any WISC subscore. (Range .34 - .58)
2. Three of five WISC P subscores correlated higher with CLT NV total than with any other CLT score. (Range .30 - .58)

TABLE 3

CORRELATION MATRIX FOR VERBAL BATTERIES
N = 62

	WISC VERBAL						LORGE-THORNDIKE VERBAL					
	1	2	3	4	5	6	7	8	9	10	11	12
WISC VERBAL												
1. Information	1.00	0.45	0.23	0.45	0.63	0.70	0.43	0.39	0.38	0.46	0.49	0.56
2. Comprehension		1.00	0.18	0.40	0.65	0.68	0.48	0.54	0.15	0.48	0.39	0.54
3. Arithmetic			1.00	0.43	0.39	0.62	0.21	0.24	0.22	0.29	0.35	0.36
4. Similarities				1.00	0.61	0.74	0.44	0.37	0.12	0.48	0.41	0.51
5. Vocabulary					1.00	0.86	0.60	0.53	0.31	0.60	0.54	0.70
6. Total Verbal						1.00	0.60	0.56	0.31	0.63	0.53	0.70
LORGE-THORNDIKE VERBAL												
7. Vocabulary							1.00	0.51	0.31	0.74	0.59	0.87
8. Sentence Completion								1.00	0.32	0.50	0.36	0.71
9. Arithmetic Reasoning									1.00	0.26	0.41	0.54
10. Verbal Classification										1.00	0.57	0.84
11. Verbal Analogy											1.00	0.79
12. Total Verbal												1.00

TABLE 4

CORRELATION MATRIX FOR NONVERBAL BATTERIES
N = 62

	WISC PERFORMANCE						LORGE-THORNDIKE NONVERBAL			
	1	2	3	4	5	6	7	8	9	10
WISC PERFORMANCE										
1. Picture Completion	1.00	0.12	0.31	0.45	0.09	0.57	0.24	0.13	0.37	0.32
2. Picture Arrangement		1.00	0.31	0.34	0.46	0.64	0.27	0.26	0.22	0.30
3. Block Design			1.00	0.55	0.30	0.73	0.43	0.33	0.48	0.52
4. Object Assembly				1.00	0.44	0.79	0.34	0.22	0.48	0.45
5. Coding					1.00	0.65	0.33	0.28	0.34	0.39
6. WISC Performance Total						1.00	0.48	0.34	0.57	0.58
LORGE-THORNDIKE NONVERBAL										
7. Pictorial Classification							1.00	0.42	0.54	0.81
8. Numerical Relations								1.00	0.48	0.75
9. Pictorial Analogy									1.00	0.86
10. Lorge-Thorndike Nonverbal Total										1.00

Exceptions were WISC Picture Completion and Object Assembly which both correlated highest with CLT Pictorial Analogy (.37 and .48). TABLES 5 and 6 show the maximum WISC and CLT subtest correlations arising from the data.

As expected, results of the V - NV matrix, TABLE 7 show that the relationships among these subtests were generally low. The highest correlation was between two CLT subtests, Pictorial Analogy and Verbal Analogy (.47). Indeed the V and NV batteries of the CLT and WISC appear to be measuring different aspects of intelligence.

Perusal of CLT, WISC Overall correlation matrix, TABLE 8, revealed that highest correlations existed among subtests within a test. Highest comparisons found between the CLT and WISC, were between the two verbal totals (.70) and between the two Full Scale scores (.74).

These results seemed to indicate that the WISC and CLT are relatively independent instruments whose subtests measure different variables. It appeared that the complete CLT V Scale is necessary in order to obtain scores similar to any of the WISC V subscores. There may be some communality between the two vocabulary tests but the proportion of common variance here is only $(.60)^2 = .36$. Even a substitution of one complete V battery for another is not advisable since proportion of common variance is again low at $(.70)^2 = .49$. If only 49 per cent of variability of WISC V score can be predicted from knowing the CLT V score perhaps that prediction

TABLE 5

CLT VERBAL SUBTESTS WHICH CORRELATED HIGHEST WITH WISC VERBAL SUBTESTS

WISC	r	LORGE-THORNDIKE
Information	0.49	Verbal Analogy
Comprehension	0.54	Sentence Completion
Arithmetic	0.35	Verbal Analogy
Similarities	0.48	Verbal Classification
Vocabulary	0.60	Vocabulary
Verbal Total	0.70	Verbal Total

TABLE 6

CLT NONVERBAL SUBTESTS WHICH CORRELATED HIGHEST WITH WISC PERFORMANCE SUBTESTS

WISC	r	LORGE-THORNDIKE
Picture Completion	0.37	Pictorial Analogy
Picture Arrangement	0.27	Pictorial Classification
Block Design	0.48	Pictorial Analogy
Object Assembly	0.48	Pictorial Analogy
Coding	0.34	Pictorial Analogy
Nonverbal Total	0.58	Nonverbal Total

All WISC, Lorge-Thorndike subtest correlations were <.61.

TABLE 7

VERBAL - NONVERBAL SUBTEST CORRELATION MATRIX
N = 62

V / NV	WISC 1	WISC 2	WISC 3	WISC 4	WISC 5	LORGE-THORNDIKE 6	LORGE-THORNDIKE 7	LORGE-THORNDIKE 8	LORGE-THORNDIKE 9	LORGE-THORNDIKE 10
WISC										
A	0.22	0.32	0.00	0.11	0.12	0.11	0.19	0.26	0.25	0.32
B	0.13	0.14	0.23	0.04	0.12	0.14	0.18	0.28	0.08	0.13
C	0.18	-0.01	0.19	0.15	0.12	0.11	0.09	0.33	0.21	0.26
D	0.15	0.08	0.18	0.13	-0.00	0.11	-0.02	0.22	0.19	0.12
E	0.19	0.14	0.35	0.09	0.36	0.03	0.08	0.02	0.16	0.05
CLT										
F	0.19	0.19	0.18	0.18	0.05	0.08	0.22	0.40	0.18	0.28
G	0.28	0.23	0.45	0.26	0.32	0.24	0.43	0.42	0.34	0.38
H	0.21	0.22	0.42	0.19	0.25	0.36	0.30	0.45	0.43	0.47

WISC PERFORMANCE

A Picture Completion
B Picture Arrangement
C Block Design
D Object Assembly
E Coding

CLT NONVERBAL

F Pictorial Classification
G Numerical Relations
H Pictorial Analogy

WISC VERBAL

1 Information
2 Comprehension
3 Arithmetic
4 Similarities
5 Vocabulary

CLT VERBAL

6 Vocabulary
7 Sentence Completion
8 Arithmetic Reasoning
9 Verbal Classification
10 Verbal Analogy

TABLE 8

CORRELATION MATRIX FOR
LORGE-THORNDIKE AND WISC I.Q. SCORES

N = 62

CLT VERBAL	CLT NONVERBAL	CLT FULL SCALE (est.)	WISC VERBAL	WISC PERFORMANCE	WISC FULL SCALE
1.00	0.57	0.90	0.70	0.33	0.62
	1.00	0.87	0.38	0.58	0.61
		1.00	0.65	0.50	0.74
			1.00	0.36	0.81
				1.00	0.84
					1.00

should not be made.

There exists even less communality between WISC and CLT nonverbal batteries. Since the highest correlation between any CLT score and WISC score was .58 (WISC P total and CLT NV total) it would seem ill-advised to consider even complete NV battery substitution in this case.

Analysis of Variance

Mean scores of the WISC and CLT are shown below in TABLE 9.

TABLE 9

MEAN SCORES OF WISC AND CLT VERBAL AND NONVERBAL BATTERIES

WISC V	WISC P	WISC FS	CLT V	CLT NV	CLT FS (est.)
102.629	106.597	105.000	100.468	105.645	103.226

A summary of the one-way analysis of variance, repeated measures, is outlined in TABLE 10.

TABLE 10

SUMMARY OF ANALYSIS OF VARIANCE

SOURCE OF VARIATION	SS	df	MS	F	P
Between People	46124.000	61	756.131		
Within People	19480.000	310	62.839		
Treatments	1573.000	5	314.600	5.3584	.00010
Residual	17907.000	305	58.711		
Total	65604.000	371			

Conservative Probability of F = .024

where df = (1, 61)

Unadjusted reliabilities $r_1 = 0.64774$ $r_k = 0.91689$

Adjusted reliabilities $r_1 = 0.66441$ $r_k = 0.92235$

If the experiment were to be repeated with the same sample the correlation between the mean scores obtained from the two sets of data would be approximately .92. The reliability of a single measurement is approximately .66. This assumes that variance due to differences between mean scores of the six subtests are systematic

sources of variation and are not part of the error of measurement.

The analysis of variance thus indicates significant differences at the .01 level between WISC and CLT intelligence quotients. Using degrees of freedom (1, n-1) the conservative test indicates significant differences at the .05 level of significance.

Since overall differences were found, the Newman-Keuls Test on Differences Between Pairs of Means and the Tukey (a) tests were used. See TABLES 11 and 12.

The CLT V I.Q. score appeared to be a significantly lower I.Q. score than the WISC P or Full Scale score, and lower than the CLT NV score. However, by selecting the complete CLT V battery, intelligence quotients similar to the WISC V I.Q. would be obtained. Willis (1970) found that while the correlation between the CLT and WISC V I.Q.'s was .81 the CLT Verbal I.Q.'s were significantly lower than the WISC I.Q.'s for his sample of twenty disturbed children. These differences did not appear for the present sample of normal school children. It may be noted that the mean age of the present sample was 2.7 years older than in the Willis sample and this could have changed the relationship between V and NV tasks for the two samples. An Edmonton study (Nyberg, 1969), indicated CLT V-NV correlations were .71 for grade 3, .56 for grade 5, and .49 for grade 8. These compare to publisher correlations of .68, .66, and .56, Wright, Thorndike, and Hagen (1972). The present CLT V-NV correlation for grade 8 was .57.

TABLE 11

NEWMAN-KEULS TEST ON DIFFERENCES BETWEEN ALL PAIRS OF MEANS

	TV (d)	WV (a)	TFS (f)	WFS (c)	TNV (e)	WP (b)
ORDERED MEANS	100.468	102.629	103.226	105.000	105.645	106.597

	a	f	c	e	b
d	2.161	2.758	4.532	4.532	6.129
a		5.597	2.371	3.016	3.968
f			1.774	2.419	3.371
c				.645	1.597
e					.952

	r = 2	r = 3	r = 4	r = 5	r = 6
$q_{.99}(r, 305)$	3.64	4.12	4.40	4.60	4.76
$(\sqrt{MS_{res}/n})\,(q_{.99}(r, 305))$					
$(.946)\,(q_{.99}(r, 305))$	3.443	3.898	4.162	4.352	4.503

	a	f	c	e	b
d			**	**	**
a					*
f					
c					
e					

** indicates significance at $\alpha = .01$
 * indicates significance at $\alpha = .05$

TABLE 12

TUKEY (a) TEST ON DIFFERENCES BETWEEN ALL PAIRS OF MEANS

where $q_{.99}$ (6,305) = 4.76

and .946 $q_{.99}$ (6,305) = 4.503

	a	f	c	e	b
d			**	**	**
a					*
f					
c					
e					

Both of these procedures indicate significant differences at α = .01 between the following pairs:

TV and WT $\tau_4 \neq \tau_3$

TV and TNV $\tau_4 \neq \tau_5$

TV and WP $\tau_4 \neq \tau_2$

Actual mean I.Q. differences are approximately 4.53, 5.18 and 6.13 between these pairs of scores.

On the basis of analysis of variance, Full Scale, Verbal and nonverbal intelligence quotients for the two tests were similar. It should be noted that differences in means between any two batteries does not necessarily indicate that these batteries are measuring different traits. These differences could merely indicate that scores differ by a simple constant. Because it is possible to have no difference in means and zero correlation or significant mean differences and a high correlation the analysis of variance indicated only that differences in means existed and that placement on the basis of two batteries which show significant differences may not coincide.

While either the WISC or the CLT may be used to assess intelligence, it did not appear feasible to suggest that any of the CLT subtests could replace WISC subtests or vice versa.

Factor Analysis

The principal component factor analysis followed by varimax rotation generally supported the above argument. Initially the factor analysis procedure was used to investigate the possibility of a reading factor in the CLT group test. Four factors were requested since it was assumed that if there was a reading factor accounting for any significant portion of the total variance it would be visible in the first four factors. For the overall factor analysis where all subtests were intercorrelated and factor analyzed, the number of

factors was determined by the unrotated matrix eigenvalues greater than one. Five factors emerged. Since it was not the purpose of this study to factor analyze the two instruments for complete study, no attempt was made to identify all the factors nor justify their existence. Since the WISC was not developed as a factor-pure measurement it cannot be assumed that each of the WISC subtests assesses a different dimension of ability. TABLES 13, 14, and 15 indicate factor loadings of the V, NV, and the complete battery of subtests obtained from factor analysis varimax rotation. The following summary indicates relevant conclusions from these analyses:

1. Verbal Analysis:

   a. CLT Vocabulary, Verbal Classification, and Verbal Analogy all loaded >.68 on Factor II. All WISC subtests loaded <.38 on this factor.

   b. WISC Vocabulary, Information, and Comprehension all loaded >.63 on Factor I. All CLT subtests except Sentence Completion loaded <.36 on this factor.

   c. CLT Arithmetic Reasoning loaded .92 on Factor IV. All other subtests loaded <.42 on this factor.

   d. Factor III seemed to be defined by two WISC V subtests: Arithmetic (.89) and Similarities (.65). All other eight subtests loaded <.39 on this factor.

   e. Communalities accounted for 76% of total variance.

2. Nonverbal Analysis:

   a. All CLT subtests loaded >.64 on Factor I. All WISC

subtests loaded <.29 on this factor.

b. Factor II appeared to be defined by two WISC subtests: Block Design and Object Assembly (.78 and .74). All other subtests loaded <.49 on this factor.

c. Factor III also seemed to be defined by two WISC subtests: Picture Arrangement and Coding (.88 and .72). All other subtests loaded <.33 on this factor.

d. The last factor appeared to be defined by the WISC Picture Completion subtest (.94).

e. Communalities accounted for 77% of the total variance.

3. Analysis of the Complete Battery:

a. Factor I appeared to be defined by all WISC and CLT V subtests except WISC Arithmetic (.25) and CLT Arithmetic (.21). All NV subtests loaded <.32 on this factor.

b. Factor II appeared to be defined by the three CLT NV subtests and one CLT V subtest (Arithmetic Reasoning).

c. Three WISC P subtests defined Factor III: Picture Completion, Block Design, and Object Assembly (all loaded >.58). All other fifteen subtests loaded <.49.

d. Factor IV seemed to be defined by two WISC P subtests: Picture Arrangement and Coding (.72 and .75). All other subtests loaded <.34.

e. Factor V seemed to be defined by the WISC Arithmetic subtest (.73). All other factors loaded <.41.

f. Communalities accounted for 66% of the total variance.

TABLE 13

FACTOR LOADINGS - VARIMAX ROTATION

VERBAL SUBTESTS	COMMUNALITIES	I	II	III	IV
WISC:					
Information	0.64	0.62	0.18	0.24	0.41
Comprehension	0.77	0.84	0.25	0.05	-0.04
Arithmetic	0.83	0.03	0.11	0.89	0.17
Similarities	0.73	0.45	0.29	0.65	-0.11
Vocabulary	0.80	0.70	0.37	0.38	0.15
LORGE-THORNDIKE:					
Vocabulary	0.85	0.34	0.84	0.07	0.11
Sentence Completion	0.59	0.67	0.31	0.04	0.20
Arithmetic Reasoning	0.90	0.13	0.16	0.06	0.92
Verbal Classification	0.81	0.35	0.81	0.18	0.06
Verbal Analogy	0.71	0.18	0.67	0.30	0.38
PERCENTAGE OF TOTAL VARIANCE	76.19	25.25	22.56	15.50	12.88

TABLE 14

FACTOR LOADINGS - VARIMAX ROTATIONS

NONVERBAL SUBTESTS	COMMUNALITIES	I	II	III	IV
WISC:					
Picture Completion	0.94	0.12	0.21	0.02	0.94
Picture Arrangement	0.82	0.15	0.05	0.88	0.13
Block Design	0.72	0.28	0.78	0.13	0.10
Object Assembly	0.79	0.06	0.74	0.32	0.37
Coding	0.71	0.17	0.38	0.72	-0.12
LORGE-THORNDIKE:					
Pictorial Classification	0.64	0.68	0.41	0.10	0.02
Numerical Relations	0.81	0.87	-0.02	0.22	0.05
Pictorial Analogy	0.72	0.65	0.48	0.06	0.26
PERCENTAGE OF TOTAL VARIANCE	76.67	22.15	21.92	18.20	14.15

TABLE 15

FACTOR LOADINGS - VARIMAX ROTATION

SUBTESTS	COMMUNALITIES	I	II	III	IV	V
WISC PERFORMANCE						
Picture Completion	0.69	0.31	0.12	0.59	0.12	-0.47
Picture Arrangement	0.67	0.03	0.38	0.05	0.72	-0.07
Block Design	0.64	0.04	0.19	0.75	-0.06	0.19
Object Assembly	0.76	-0.00	0.17	0.79	0.33	-0.03
Coding	0.73	0.09	-0.09	0.22	0.75	0.34
LORGE-THORNDIKE NONVERBAL						
Pictorial Classification	0.53	0.05	0.67	0.24	0.13	0.03
Numerical Relations	0.64	0.25	0.64	0.01	0.18	0.37
Pictorial Analogy	0.68	0.23	0.56	0.48	0.03	0.29
WISC VERBAL						
Information	0.49	0.66	0.18	0.10	0.13	-0.01
Comprehension	0.72	0.78	0.03	-0.03	0.27	-0.18
Arithmetic	0.71	0.25	0.25	0.11	0.21	0.73
Similarities	0.61	0.66	-0.04	0.12	-0.02	0.40
Vocabulary	0.74	0.72	-0.14	0.01	0.31	0.34
LORGE-THORNDIKE VERBAL						
Vocabulary	0.64	0.76	0.20	0.06	-0.14	0.04
Sentence Completion	0.70	0.74	0.35	-0.15	0.08	0.04
Arithmetic Reasoning	0.68	0.21	0.78	0.15	-0.01	-0.09
Verbal Classification	0.69	0.76	0.16	0.23	-0.10	0.13
Verbal Analogy	0.64	0.61	0.40	0.22	-0.17	0.16
PERCENTAGE OF TOTAL VARIANCE	66.41	24.38	13.73	11.47	8.53	8.27

CHAPTER V

CONCLUSIONS AND IMPLICATIONS

It seems evident from the results of the V and NV correlation matrices between WISC and CLT subtests that each instrument is in itself a self-contained unit. Communality between any WISC, CLT subtests was low. The one-way analysis of variance also indicated significant differences between WISC and CLT intelligence quotients. The Newman-Keuls Test on Differences Between Pairs of Means and the Tukey (a) Test revealed that these differences were located between the CLT V and WISC P, CLT V and WISC Full Scale, CLT V and CLT Full Scale (estimated) as well as between WISC V and P. Thus the complete CLT V battery could be used to predict WISC V quotients, although this may not be advisable since the proportion of predictable variance was only .49. Also, no significant differences were found between the CLT NV and WISC P, but the proportion of predictable variance in this case was less than .36. Even if the estimated CLT Full Scale scores were used to predict WISC Full Scale scores, the proportion of predictable variance is only $(.74)^2 = .55$. Smallest mean differences in intelligence quotients were found between WISC V and CLT Full Scale (estimated) and between WISC Full Scale and CLT NV (both differences $<.65$ I.Q. points).

One of the possible explanations for the relatively low WISC, CLT intercorrelations may be a reading factor present in the

[illegible]

[illegible]

[illegible]

[illegible]

group administered test. Results of the V and NV subtest factor analyses supported this hypothesis. Factor II in the V analysis and Factor I in the NV analysis were mainly defined by CLT subtests. Two CLT V subtests did not load heavily on Factor II (Verbal Analysis), namely Sentence Completion (which seemed to go along with three of the WISC subtests in defining Factor I) and Arithmetic Reasoning which almost entirely defined Factor IV. Since the most difficult words in this latter subtest are "represents" and "established", it is not unreasonable to suggest that reading may not be as much of a consideration in this subtest as in the other CLT V subtests. These words should be known to the grade eight student and responses are therefore probably not as dependent upon ability to read as upon ability to reason. (The WISC Arithmetic subtest loaded only .17 on Factor IV (Verbal analysis) but defined Factor III (.89 Verbal analysis).) If indeed Factors II (Verbal analysis) and I (Nonverbal analysis) are reading factors and represent twenty-five per cent and twenty-two per cent of the total variance respectively, this could account for some of the WISC, CLT subtest differences.

All three factor analyses tended to support the independency of the two instruments. The only existing overlap in either the V or NV analysis was in the above noted instance of the CLT Sentence Completion which loaded on Factor I (.67 Verbal analysis) along with three of the WISC V subtests. When an additional fifth factor was extracted the Sentence Completion subtest paired up with WISC

Comprehension only. This would lead to the possible conclusion that a comprehension factor was being defined here. In all other instances, factors for both analyses were defined by either WISC or CLT subtests but not both.

As expected, the overall V, NV factor analysis appeared to extract a general verbal Factor I supported by all V subtests except WISC and CLT Arithmetic subtests. When only the V subtests were analyzed, a general overall verbal factor did not appear. It would seem that this general verbal factor is differentiating out from NV subtests rather than indicating a communality between V subtests. Three of the remaining four factors which had eigenvalues greater than one were defined by WISC subtests. There did not appear to be one exclusive nonverbal factor covering all P subtests. This would strongly reinforce the suggestion that WISC and CLT nonverbal subtests are measuring different characteristics. The CLT V Arithmetic Reasoning subtest which previously defined a unique factor now loaded heavily with the three NV subtests of the same instrument. The WISC Arithmetic subtest did not load on the same factor as other WISC P subtests.

It seems apparent that the two instruments are indeed measuring the same trait, that is, intelligence. Significant differences in Full Scale I.Q. were not found for this sample. Correlation between the two Full Scale scores was .74. For the purposes of obtaining an overall I.Q. therefore, either test may be used. When a nonverbal score is needed, however, both tests

should be considered since it appears that even though no significant differences were found between means the nonverbal batteries are in fact measuring different abilities (correlation .58). This hypothesis is strongly substantiated by the factor analysis of both nonverbal batteries alone and by the overall factor analysis.

In consideration of the major question of this study, namely, is it reasonable to substitute any of the CLT subtests for any of the WISC subtests for diagnostic purposes, the answer appears to be a decided "no". The overall intelligence quotients between the CLT and the WISC appear to be similar, at least in any practical sense. However, the constituent factors in these Full Scale scores did not have sufficient communality to justify possible substitution of any one subtest for the other. The overlap of CLT and WISC subtests on factors in the two individual battery factor analyses was almost nonexistent. The overlap between CLT and WISC V subtests on Factor I of the complete factor analysis disappeared as soon as nonverbal subtests were removed.

Several secondary conclusions have resulted from the study. The existence of a possible reading factor in the CLT was substantiated by both the verbal and nonverbal factor analyses. In any case, there appeared to be some factor present in the CLT which was not in the WISC. Since the verbal, nonverbal effect was probably stronger than the "reading or not reading" effect it is reasonable that this reading factor did not appear in the complete analysis but was replaced by the general verbal Factor I. Secondly, high

correlations within each test indicated that either the CLT V or NV battery may be used instead of the total CLT battery to obtain an I.Q. score (correlation .90 and .87). There is less assurance that a similar procedure could be used with the WISC batteries although correlations were still fairly high. If there is any reason to suspect a reading disability both verbal and nonverbal batteries should be used. While Full Scale I.Q.'s tended to be similar for the group, the possible presence of a reading factor in the CLT could suggest that in the instance of known reading difficulty, the WISC batteries should be given.

Since neither instrument scored consistently higher or lower than the other it appears that possible administrative differences have indeed balanced out. That is, CLT administration at a less threatening time of year may have been countered by the one-to-one WISC interview by nonschool personnel. In general, students tended to score higher on the nonverbal batteries although not statistically significantly higher than on the WISC V battery.

In conclusion, it appears that although both the WISC and CLT tests appeared to be measuring the same general trait, the WISC and CLT subtest scores did differ significantly. While similar intelligence quotients are obtained when complete batteries are used it does not seem feasible to consider replacing any of the WISC subtests by CLT subtests or even to substitute all of the subtests of the CLT test for diagnostic purposes in a large Alberta school system. Further research in which Canadian norms would be

used for both group and individual tests administered to various grade levels would add valuable data to existing research on the relatively new CLT.

B I B L I O G R A P H Y

BIBLIOGRAPHY

Ackerman, P. T., Peters, J. E. and Dykman, R. A. Children With Specific Learning Disabilities: Bender Gestalt Test Findings and Other Signs, Journal of Learning Disabilities, 1971, 4, No. 8, 437-446.

Altus, G. T. A Note on the Validity of the Wechsler Intelligence Scale for Children, Journal of Consulting Psychology, 1952, XVI, 231.

Altus, G. T. Relationships Between Verbal and Nonverbal Parts of the CTMM and WISC, Journal of Consulting Psychology, 1955, 19, 2, 143-144.

Altus, G. T. A WISC Profile for Retarded Readers, Journal of Consulting Psychology, 1956, 20, 155-156.

Barclay, A. and Cardan, P. A Comparative Study of the WISC and the Stanford-Binet Intelligence Scale, Form LM, Journal of Consulting Psychology, 1966, 30, 563.

Blair, G. M. and Kamman, J. F. Do Intelligence Tests Requiring Reading Ability Give Spuriously Low Scores to Poor Readers at the College Freshman Level?, Journal of Educational Research, 36, 1942, 280-283.

Brittain, M. A Comparative Study of the Use of the Wechsler Intelligence Scale for Children and the Stanford-Binet Intelligence Scale, Form LM, With Eight Year Old Children, British Journal of Educational Psychology, 1968, 38, 103-104.

Burks, H. F. and Bruce, P. Characteristics of Poor and Good Readers as Disclosed by the Wechsler Intelligence Scale for Children, Journal of Educational Psychology, 1955, 46, 488-493.

Churchill, W. D. and Smith, S. E. The Relationship of the 1960 Revised Stanford-Binet Intelligence Scale to Intelligence and Achievement Test Scores Over a Three-Year Period, Educational and Psychological Measurement, 1966, 26. 1015-1020.

Corwin, B. J. The Influence of Culture and Language on Performance, Journal of School Psychology, 1965, 3, 41-47.

Dunn, L. M. Peabody Picture Vocabulary Test Manual. Minneapolis: American Guidance Service, 1959.

Estes, B. W., Curtin, M. E., De Burger, R. A. and Denny, C. Relationship Between the 1960 Stanford-Binet, WISC, Raven, and Draw-a-Man, Journal of Consulting Psychology, 1961, 25, 388-391.

Estes, B. W. Relationships Between the Otis, 1960 Stanford-Binet and WISC, Journal of Clinical Psychology, 1965, 21, 296-297.

Flax, M. L. A Comparison of the Peabody Picture Vocabulary Test With the Wechsler Intelligence Scale for Children, The Journal of Educational Research, 1968, 62, No. 3, 114-116.

French, J. L. Pictorial Test of Intelligence Manual, Boston: Houghton Mifflon, 1964.

Gage, G. E. and Naumann, T. F. Correlation of the Peabody Picture Vocabulary Test and the Wechsler Intelligence Scale for Children, The Journal of Educational Research, 1965, 58, 10, 466-468.

Graham, E. E. Wechsler-Bellevue and WISC Scattergrams of Unsuccessful Readers, Journal of Consulting Psychology, 1952, 16, 268-271.

Hirst, L. S. The Usefulness of a Two Way Analysis of WISC Subtests in the Diagnosis of Remedial Reading Problems, Experimental Education, 1960, 29, 153-160.

Hopkins, K. D. and Michael, W. B. The Diagnostic Use of WISC Subtest Patterns, California Journal of Educational Research, 1961, 12, 116-117, 130.

Houston, C. and Otto, W. Poor Readers' Functioning on the WISC, Slossen Intelligence Test and Quick Test, The Journal of Educational Research, 1968, 62, No. 4, 157-159.

Hughes, R. B. and Lessler, K. A Comparison of WISC and Peabody Scores of Negro and White Rural School Children, American Journal of Mental Deficiency, 1964-65, 69, 877-880.

Jones, S. The WISC Applied to a Sample of London Primary School Children, British Journal of Educational Psychology, 1962, 32, 119-133.

Kallos, G. L., Grabow, E. and Guarino, A. The WISC Profile of Disabled Readers, Personnel and Guidance Journal, 1961, 39, 476-478.

Karnes, L. R. The Comparison of Scores of Eighth-Grade Reading and Nonreading Boys on the Lorge-Thorndike Tests, Wechsler Intelligence Scale for Children, The D48 Test, and the Welsh Figure Preference Test, GW Scale, Dissertation Abstracts, 1969-70, 30, 585A-586A.

Lessler, K. and Galinsky, M. D. Relationship Between Slosson Intelligence Test and WISC Scores in Special Education Candidates, Psychology in the Schools, 1971, III, No. 4, 341-344.

Levinson, B. M. A Comparative Study of the Verbal and Performance Ability of Monolingual and Bilingual Native Born Jewish Preschool Children of Traditional Parentage, Journal of Genetic Psychology, 1960, 97, 93-113.

Lorge, I., Thorndike, R. and Hagen, E. Technical Manual, Lorge-Thorndike Intelligence Tests. New York: Houghton Mifflin, 1966.

Lorge, I., Thorndike, R., Hagen, E., Wright, E. N. Manual for Administration, Canadian Lorge-Thorndike Intelligence Tests. Thomas Nelson & Sons (Canada) Ltd., 1967.

Lucito, L. and Gallagher, J. Intellectual Patterns of Highly Gifted Children on the WISC, Peabody Journal of Education, 1960, 38, 131-136.

McCoy, G. F. Scores of High and Low Achieving Academically Gifted Pupils on Individual Measures of Intellectual Ability, American Psychologist, 1963, 18, 378.

Miller, C. K. and Chansky, N. M. Psychologists' Scoring of WISC Protocols, Psychology in the Schools, 1972, 9, No. 2, 144-152.

Moed, G., Wright, B. W. and James, P. Intertest Correlations of the Wechsler Intelligence Scale for Children and Two Picture Vocabulary Tests, Educational and Psychological Measurement, 1963, XXIII, No. 2, 359-363.

Neville, Donald. A Comparison of the WISC Pattern of Male Retarded and Nonretarded Readers, Journal of Educational Research, 1961, 54, 195-197.

Neville, Donald. The relationship Between Reading Skills and Intelligence Test Scores, The Reading Teacher, 1965, 18, 257-262.

Nyberg, V. R. Canadian Lorge-Thorndike Intelligence Test - A User's Appraisal. A paper presented at the Convention of the Canadian Guidance and Counselling Association, Edmonton, Alberta, June, 1969.

Roebeck, M. Subtest Patterning of Problem Readers on WISC, California Journal of Educational Research, 1958, 51, 459-464.

Roebeck, M. Intellectual Strengths and Weakness Shown by Reading Subjects on the WISC, Journal of Developmental Reading, 1964, VII, No. 2, 120-129.

Rohrs, F. W. and Haworth, M. R. The 1960 Stanford-Binet, WISC, and Goodenough's Test With Mentally Retarded Children, American Journal of Mental Deficiency, 1962, 66, 853-859.

Sawyer, R. I. Does the Wechsler Intelligence Scale for Children Discriminate Between Mildly Disabled and Severely Disabled Readers?.The Elementary School Journal, 1965, 66, 97-103.

Shaw, D. J., Mathews, C. G. and Klave, H. The Equivalence of WISC and PPVT I.Q.'s, American Journal of Mental Deficiency, 1966, 70, 601-604.

Sheldon, M. S. and Garton, J. A Note on 'A WISC Profile for Retarded Readers', Alberta Journal of Educational Research, 1959, 5, 264-267.

Slossen, R. L. Slossen Intelligence Test (SIT) for Children and Adults, revised, New York: Slossen Educational Publications, 1963.

Sonneman, L. J. A Study of the Relationship Between Four Tests of Intelligence and One Test of Scholastic Ability, Dissertation Abstracts, 1964, 24, 4555.

Walker, K. P. and Gross, F. L. I.Q. Stability Among Educable Mentally Retarded Children, Training School Bulletin, 1970, 66, 181-187.

Willis, Jerry. Group Versus Individual Intelligence Tests in One Sample of Emotionally Disturbed Children, Psychological Reports, 1970, 27, 819-822.

Wills, I. H. Prescriptive Teaching from WISC Patterns, The Vulnerable Child, Academic Therapy, 1971, VII, No. 1, 79-83.

Wright, E. N., Thorndike, R. L. and Hagen, E. Technical Supplement, Canadian Lorge-Thorndike Intelligence Tests, Thomas Nelson & Sons (Canada) Ltd., 1972.

Zimmerman, I. L. and Williamson, J. A Comparison of WISC and Stanford-Binet LM Scores for Mentally Retarded School Children. Unpublished Manuscript, 1965.

Zimmerman, I. L. and Woo-Sam J. Research With the Wechsler Intelligence Scale for Children: 1960-1970, Journal of Clinical Psychology, 1972, Monograph 33.